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National Highway
Traffic Safety
Administration



Shelve in stacks

S.B.T.

Highway Safety Literature

... A SEMI-MONTHLY ABSTRACT JOURNAL

73-3

AVAILABILITY OF DOCUMENTS

GPO: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. **Give corporate author, title, personal author, and report number.** Prepayment is required by GPO coupon (NTIS coupons are not acceptable), check or money order (made payable to the Superintendent of Documents).

HRB: Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

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NHTSA: National Highway Traffic Safety Administration, General Services Division, Washington, D.C. 20590, **Give HS-No.**

SAE: Society of Automotive Engineers, Dept. HSL, 2 Pennsylvania Plaza, New York, N.Y. 10001. **Order by title and SAE report numbers.** Prices given are list; discounts are available to SAE members and sometimes to libraries and U.S. Government Agencies. Prepayment is required; orders received without payment are subject to a \$1 handling charge.

Journal articles should be obtained from the publisher.

Material directly related to Highway and/or Motor Vehicle Safety is solicited for inclusion in Highway Safety Literature. Topics must fall within the scope of the Subject Fields and Groups listed on the inside front cover. Submit material, together with a written statement of approval for publication to:

Office of Administrative Services (N48-50)

National Highway Traffic
Safety Administration
400 7th Street, S.W.
Washington, D.C. 20590

Please indicate availability source and price if there is a charge for the material.

SAMPLE ENTRIES

Subject Categories			
NHTSA Accession No.	HS-800 218 Fld. 5/21; 5/9	HS-004 497 Fld. 5/19	
Title of document	AN INVESTIGATION OF USED CAR SAFETY STANDARDS-SAFETY INDEX: FINAL REPORT. VOL. 6 - APPENDICES G-L	AUTO THEFT--THE PROBLEM AND THE CHALLENGE	
Personal author(s)	by E. N. Wells; J. P. Fitzmaurice; C. E. Guilliams; S. R. Kalin; P. D. Williams	by Thomas A. Williams, Sr.	
Corporate author	Operations Research, Inc.	Journal citation	Published in <i>FBI Law Enforcement Bulletin</i> v37 n12 p15-7 (Dec. 1968)
Pagination			
Publication date	1969 150p Contract FH-11-6921 Report no. ORI-TR-553-Vol. 6; PB-190 523		Gives figures on the extent of the auto theft problem and comments on anti-theft devices available now or in the planning stage.
Abstract	Appendices G-L to this study of used car safety standards include: indenture model diagrams for classes I-IV motor trucks; degradation, wear, and failure data for motor truck classes I-IV; and safety index tables for classes I-IV motor trucks. Search terms; Wear; Trucks; Failures; Used cars; Inspection standards	Search terms: Theft; Theft protection; Stolen cars	
Availability	NTIS		(Note: If the date of a report or Journal article is not given, the small letters <u>nd</u> will appear)

NOTE: () Numbers in parentheses following certain subject groups indicate the Highway Safety Program Standards (No. 1 and up) and/or Federal Motor Vehicle Safety Standards (No. 101 and up) which may apply to these groups.

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1/0 ACCIDENTS

1/2 Injuries

HS-012 132 Fld. 1/2; 4/5

MINI-CAR OCCUPANT INJURIES
AND PICTURE INTERPRETA-
TION

by B. C. Brown

Published in *HIT Lab Reports* v2 n11
p1-6 (Jul 1972)

1972

A recently developed HSRI accident data file containing information on occupants in selected mini-cars is described in terms of composition and file bias, and searched in an effort to exhibit the distribution throughout the data of model, injury, and accident configuration. Opel and Pinto are the most highly represented models. The greatest segment of the cases (66.7%) involved no occupant injury. Occupants receiving injuries were involved in rear-end collisions (29.1%), right-angle/sideswipe collisions (25.5%), and single-vehicle collisions (27.3%). Occupants receiving little or no injury were also involved in right-angle/sideswipe (47.5%) and rear-end accidents (32.0%). A category combining right-angle and sideswipe collisions represents nearly half (46.2%) of the data. Future plans for the data involve comparing the file with the representation of the same models in the vehicle population of the state of Michigan and other areas.

Search terms: Compact automobiles; Accident report forms; Electronic accident analysis; Compact automobile accidents; Accident types; Injury severity; Injuries by vehicle model; Injuries by accident type; Automated accident records; Injuries by vehicle size; Automobile models

HS-012 138 Fld. 1/2; 1/3

INJURY CONTROL. ACCIDENT
PREVENTION AND OTHER AP-PROACHES TO REDUCTION OF
INJURY

by S. P. Baker

Johns Hopkins Univ., J03600

1972 33p 104refs

A chapter from *Preventive Medicine and Public Health*, 10th ed., edited by P. E. Sartwell, Appleton-Century Crofts, 1972.

The magnitude of the injury problem, epidemiology, role of public agencies, and choice and evaluation of counter-measures are discussed. Emphasis is placed on the results of acute interactions between man and the physical and chemical hazards of his environment. The precrash, crash, and postcrash phase analysis of vehicle accidents is discussed and compared with a ten-fold strategy for injury control and a model illustrating the imbalance between human capabilities and system demands. Epidemiological factors discussed include age; socioeconomic and physical environment; relationship between stopping distance, velocity change, and injury.

Search terms: Accident prevention; Health hazards; Injury causes; Precrash phase; Crash phase; Postcrash phase; Injury prevention; Injury statistics; Fatality rates; Epidemiology; Age factor in accidents; Accident causes; Sex factor in accidents; Injury probability; Driver performance; Man machine systems; Drinking drivers; Blood alcohol levels; Sociological factors; Environmental factors; Stopping distance; Impact forces; Impact velocity; Loading (operator performance)

AVAILABILITY:

Insurance Inst. for
Highway Safety
Watergate 600
Washington, D.C. 20037

HS-012 143 Fld. 1/2

EVALUATION OF SEVERITY
CODES IN ACCIDENT DATA

by R. E. Scott

Published in *HIT Lab Reports* p8-13
(Mar 1972)

1972 3refs

Extracted from final report on
Contract FH-11-7293, HS-800 487.

Improved injury severity codes are needed in mass accident data in order to permit improved analyses of injury causation. A comparison of standard police injury codes and the new Abbreviated Injury Scale was conducted using Washtenaw County accident reports and injury diagnosis data from St. Josephs Hospital in Ann Arbor. Findings indicate a low incidence of moderate or greater injury among the police codes and the failure of the police scale to categorize severity except among the minor injuries. Variations in distribution of police codes among states and among Michigan counties were studied and found to be quite wide. The recently changed Michigan police scale is found to have a closer correspondence with the AIS codes than previously.

Search terms: Injury severity index; Injury classification; Michigan; Accident reports; Police reports; Statistical analysis

HS-800 715 Fld. 1/2

ANALYSIS OF VEHICLE INJURY
SOURCES. FINAL REPORT

by T. E. Anderson

Cornell Aeronautical Lab., Inc., C67200

1972 136p 40refs
Contract DOT-HS-053-1-109; Ref:
FH-11-7098
Report no. CAL-ZM-501 0-V-2R

Two vehicle age classifications were selected (vehicles not equipped with a majority of the safety oriented modifications of interest, 1960-1965; vehicles

1/2 Injuries (Cont'd.)**HS-800 715 (Cont'd.)**

equipped with these design modifications, 1968-1971) and compared on the basis of similar accident circumstances, such as impact speed, seated position, restraint utilization, site of impact, vehicle make, and vehicle size. In general, the difference in occupant injury risk between the two vehicle age classifications was found to be minimal. The influence of vehicle size, seated position, and vehicle make conformed to the expected patterns in both vehicle age classifications. Rear seated position was found to be the least hazardous; injury potential was found to increase as vehicle size decreased; and no consistent trends were determined for variations in vehicle make.

Search terms: Secondary collisions; Injury causes; Injuries by vehicle age; Injuries by vehicle size; Injuries by seat occupation; Injuries by vehicle make; Accident types; Accident severity; Injury severity; Steering wheel caused injuries; Windshield caused injuries; Instrument panel caused injuries; Seat caused injuries; Mirror caused injuries; Automobile interior design; Rearview mirrors; Automobile safety characteristics; Injury probability; Door caused injuries; Ejection caused injuries; Injury statistics; Damage severity; Head injuries; Chest injuries; Pillar caused injuries; A pillars; Door latch failures; Seat belt effectiveness; Seat belt usage; Safety device effectiveness; Head restraint caused injuries; Impact velocity

AVAILABILITY: NTIS**1/3 Investigation****HS-012 139 Fld. 1/3****ACCIDENT FREQUENCY AS RELATED TO VEHICLE SIZE**

by H. W. Case; A. Burg; J. D. Baird

California Univ. Inst. of Transp. and Traf. Engineering, C17000

1972 49p 8refs
Report no. UCLA-ENG-7261

A pilot study of the relationship between vehicle size and accident involvement was conducted, using a sample of nearly 9,000 registered owners of selected subcompact, compact, and full-size cars in California. A mail questionnaire was utilized, and the information collected included personal data, vehicle usage data, and accident experience of the vehicles being surveyed. The results of this study suggest that there is no systematic relationship between size of vehicle and frequency of accident involvement, when the known effects of age and quantitative exposure to risk are controlled for. Marked differences in response rate among owners of the different vehicle makes suggest that the study results must be regarded as tentative pending detailed comparison of the respondent sample with the non-respondents for each make. An outline is put forth for a full-scale study to provide definitive information in this important area.

Search terms: Accidents by vehicle size; Questionnaires; Accident rates; Sampling; Data acquisition; Data analysis; Driver age; Accidents by vehicle make; Vehicle size; Compact automobile accidents; Vehicle mileage; Statistical analysis; Driver mileage; Driver sex; Driver characteristics; Driver records

HS-012 140 Fld. 1/3; 5/20**MOTOR CARRIER ACCIDENT INVESTIGATION. TRIP TRANSPORT, INC. ACCIDENT—FEBRUARY 6, 1972—NEAR READING, PENNSYLVANIA**

Bureau of Motor Carrier Safety, B32400

1972 10p
Report no. 72-1

A truck, westbound on the Pennsylvania Turnpike, traveling at a speed later estimated at 55 mph, left the wet and slippery roadway on a slight left-hand curve and struck the medial guard rail with the left front tractor bumper. Rebounding and traveling 234 feet across the two westbound lanes and shoulder, the front end of the truck struck a concrete bridge parapet, 2 feet high, bordering the north side of the highway. The truck driver was ejected through the left windshield and fell 55 feet to his death, in the ravine below. Damage to truck and public property amounted to \$50,000. Based upon available evidence, it appears this accident was contributed to by the driver's fatigued condition which may have inhibited him in taking evasive action when his truck, which was being operated at a speed too fast for conditions, went out of control on a wet and slippery roadway. The driver had exceeded hours of service limitations.

Search terms: Accident case reports; Truck accidents; Accident investigation; Driver fatalities; Pennsylvania; Property damage accidents; Vehicle barrier collisions; Driver fatigue caused accidents; Loss of control caused accidents; Wet road conditions; Ejection; Work time standards; Wet skidding; High speed caused accidents

HS-012 141 Fld. 1/3; 5/20**MOTOR CARRIER ACCIDENT INVESTIGATION. SEYMOUR FOODS, INC. ACCIDENT—DECEMBER 18, 1971—UNION, NEBRASKA**

Bureau of Motor Carrier Safety, B32400

1972 13p
Report no. 71-8

As the southbound truck, traveling approximately 60-65 mph, was nearing a bridge, the left front tire blew out. The driver lost control and the vehicle entered the opposing lane, colliding

head-on with an oncoming passenger car at the north end of the bridge. The fuel tank on the car ruptured engulfing the car in flames. The car, with its two occupants inside, came to rest in a shallow creek 12 feet below the bridge. Upon impact, the truck driver was ejected onto the pavement. The truck continued across the bridge and came to rest in an upright position in a field on the east side of the road. The driver claimed he heard a loud explosion prior to the tire failure and then lost control of his truck. Both car occupants perished. The truck driver was injured, and property damage amounted to \$10,000. The truck had serious mechanical defects.

Search terms: Head on collisions; Truck accidents; Accident case reports; Loss of control caused accidents; Accident investigation; Tire failure caused accidents; Accident caused fires; Fatalities; Nebraska; Property damage accidents; Fuel tank rupture; Truck defects; Truck maintenance; Ejection

HS-012 142 Fld. 1/3; 1/1; 3/6

A SURVEY OF MEDICAL ASPECTS OF TRAFFIC SAFETY

by R. Andreasson

Published in *Technical Aspects of Road Safety* n49 p4.1-4.7 (Mar 1972)

1972

Serious efforts are now being made to prevent motor vehicle accidents, thanks to a growing number of professional people who set up an epidemiology of accidents and want health education to be concerned about teaching the driving population safe driving habits and physicians to advise their patients concerning the relationship between health and motor vehicle safety. A traffic medicine association should, in the field of preventive medicine, develop mechanisms for prevention of traffic accidents, and in the field of public

health, educate people about the medical aspects of traffic safety, and develop programs for the rehabilitation of persons who have been involved in accidents. Physicians should concern themselves with driver license standards. A first aid program for motorists in Sweden is described, and it is suggested that many lives could be saved if passing motorists could give immediate aid to accident victims.

Search terms: Physicians and highway safety; First aid; Driver rehabilitation; Epidemiology; Accident prevention; Safety education; Driver license standards; Accident survivability; Sweden

HS-012 174 Fld. 1/3; 1/2

OAKLAND COUNTY'S IN-DEPTH COLLISION- INVESTIGATION PROGRAM

by R. E. Scott

Published in *HIT Lab Reports* v2 n12 p1-8 (Aug 1972)

1972 5refs

Procedures involved in setting up and operating the first year of a new accident investigation and data collection project for obtaining injury causation information for recent model cars involved in accidents are described. About 400 accidents per year are being investigated. Statistics are given on accidents by model year, injury severity, type of accident, and vehicle make.

Search terms: Michigan; Data acquisition; Accident statistics; Injury rates; Accident types; Accidents by vehicle age; Accidents by vehicle make; Injury severity; Accident analysis; Fatalities; Accident rates; Accident investigation

HS-012 188 Fld. 1/3

PROBLEMS OF DETERMINING CAUSES OF SPECIFIC ACCIDENTS

by J. S. Baker

Northwestern Univ. Traf. Inst., N74400

1963 29p 23refs
Contract CPR-11-8672
Report no. SN-1112

The purpose of this report is to consider how opinions about contributing factors to accidents are reached, whose opinions should be accepted, and how much confidence can be put in opinions from currently available sources. The following conclusions were reached: Tabulations of objective information on accidents concerning circumstances or conditions which may be observed after the accident are reliable and useful for statistical analysis. Tabulations of conclusions concerning circumstances which were not reliably observed are likely to be misleading. Forming proper conclusions requires technical knowledge and practical experience. The ordinary police accident investigator's training is quite inadequate for the task. General expressions of opinions concerning causes by drivers and police should be discouraged. Accidents studies by specially qualified people should be published. A program of special studies of limited aspects of accidents should be developed. In such a program, police can collect data for analysis by technically qualified technicians.

Search terms: Accident analysis; Accident causes; Accident investigation; Accident reconstruction; Accident investigation training; Accident reports; Accident factors; Police reports

HS-012 189 Fld. 1/3

CONCEPTS AND CLASSIFICATIONS OF TRAFFIC ACCIDENT CAUSES

by J. S. Baker; H. L. Ross

Northwestern Univ. Traf. Inst., N74400

1960 119p refs
Contract RG-5359; CPR-11-5981
Report no. SN-1109

1/3 Investigation (Cont'd.)

HS-012 189 (Cont'd.)

Supported by Public Health Service, Bureau of Public Roads, and Automotive Safety Foundation.

Current concepts of accident causes tend to represent special or limited viewpoints. Applying insight gained from case studies, old and new concepts of accident causes are examined, compared, and fitted into a coherent and integrated pattern. One objective was to provide a plan for analyzing a specific accident in such a manner that contributing factors and their relationships may be systematically discovered.

Search terms: Accident causes; Accident investigation; Data acquisition; Accident types; Accident reconstruction; Accident factors; Accident analysis; Human factors; Accident responsibility; Driver emergency responses; Accident proneness; Failure caused accidents; Hazard perception; Accident avoidance; Driver errors; Man machine systems; Driver vehicle road interfaces; Systems analysis; Precrash phase; Crash phase; Driving task analysis; Accident case reports

HS-800 713 Fld. 1/3

MULTIDISCIPLINARY ACCIDENT INVESTIGATION. FINAL REPORT 3

by G. W. May; W. E. Baker

New Mexico Univ., N43200

1970 192p 2refs
Contract FH-11-7216

The results of a study of 25 accidents are presented. Copies of the standard summaries of each case, including the accident diagram, are included. Analysis of the cases covers human, vehicle, and environmental factors. Conclusions and recommendations are given regarding

driver training, drinking drivers, seat belt usage, highway design, and vehicle safety standards.

Search terms: Multidisciplinary teams; Accident investigation; Accident scale drawings; Precrash phase; Crash phase; Postcrash phase; Drinking drivers; Driver age; Fatalities; Albuquerque; Accident case reports; Injury severity; Driver education; Human factors; Environmental factors; Seat belt usage; Vehicle safety standards; Injury severity index; Accident analysis; Accident causes; Injuries by body area; Accidents by vehicle age; Injury causes; Accident location; Accident types; Highway design; Driver characteristics; Accidents by body types; Accidents by vehicle make; Automobile defects; Secondary collisions

AVAILABILITY: NTIS

HS-800 716 Fld. 1/3

ACCIDENT CAUSE ANALYSIS. FINAL REPORT

by K. Perchonok

Cornell Aeronautical Lab., Inc., C67200

1972 78p 9refs
Contract DOT-HS-053-1-109
Report no. CAL-ZM-5010-V-3

A system had been developed to describe the process of accident generation. It was modified and applied to accident reports from a variety of sources ranging from routine police reports to intensive, on scene investigations. Comparisons were made among the samples in terms of their value in providing causation information. Frequently occurring accident causal structures were determined. The influence upon modes of involvement and culpability were measured for drinking, lighting conditions, driver education, and selected driver characteristics.

Search terms: Accident causes; Accident reports; Drinking drivers; Driver

intoxication; Ran off road accidents; Driver error caused accidents; Day vs night accidents; Age factor in accidents; Driver education evaluation; Sex factor in accidents; Precrash phase; Accident types; Driver characteristics; Urban accidents; Rural accidents; Single vehicle accidents; Accidents by vehicle size; Statistical analysis; Accident analysis; Road curves; Failure caused accidents; Accident responsibility

AVAILABILITY: NTIS

HS-800 729 Fld. 1/3

HIGHWAY COLLISION INVESTIGATION TRAINING PROGRAM. FINAL REPORT

by J. W. Garrett

Cornell Aeronautical Lab., Inc. C67200

1972 90p 58refs
Contract FH-11-7572
Report no. CAL-VJ-2980-V2

The report describes the planning and organization of the training program, preparation of course syllabus, and the conducting of three training sessions of three weeks each for members of multidisciplinary collision investigation teams and others selected by NHTSA. The test tracks, skid pans, and impact sleds used at training sessions are described.

Search terms: Multidisciplinary teams; Accident investigation training; Training facilities; Program evaluation; Accident reconstruction; Test tracks; Skid pans; Impact sleds

AVAILABILITY: NTIS

1/4 Locations

HS-012 164 Fld. 1/4; 4/3; 2/4

RAILROAD-HIGHWAY SAFETY. PT. 2: RECOMMENDATIONS

FOR RESOLVING THE PROBLEM. REPORT TO CON- GRESS.

Federal Railroad Administration,
F07200; Federal Hwy. Administration,
F06000

1972 118p

This report makes recommendations for improving safety at both public and private crossings of railroads, together with equitable allocation of costs, and discusses possible funding alternatives for financing an effective public grade crossing improvement program. It also modifies and refines the inventory, accident, and other data contained in Part I, reflecting the latest and best information available on the numbers of crossings, accidents, costs, and expenditures. The primary goal of the study was to determine grade crossing improvement needs nationwide and, as appropriate, identify a feasible program level which would lead to a significant reduction in accidents, fatalities, personal injuries, and property damage, together with reasonable improvement in the mobility of highway traffic and railroad operations.

Search terms: Railroad grade crossing accidents; Vehicle train collisions; Accident statistics; Traffic volume; Accident location; Accident prevention; Federal aid; State government; Financing; Pedestrian accidents; Benefit cost analysis; Economic analysis; Railroad grade crossings; Highway improvements; Safety education; Warning systems; Time costs; Road jurisdiction

1/5 Statistical data

HS-012 159 Fld. 1/5; 5/20; 1/3

TRAILER TOWING COMBINA- TION TRAFFIC ACCIDENTS IN SOUTH CAROLINA IN 1971

by W. M. Shepherd

Clemson Univ., C48000

1972 49p 14refs

Master's thesis.

This study was conducted to examine the involvement of trailer towing combinations in traffic accidents and define the factors affecting their safe operation on South Carolina highways. Three classes of trailers were studied: utility, boat, and camping trailers. Results of this study are presented in tabular form. The percentage of accidents attributable to equipment defects should be of sufficient magnitude to warrant an annual inspection of these units. An examination of the boat and trailer weight data indicates that a number of boat trailer units may be in violation of state law. The motor vehicle inspection regulations fall short of the desired goal relating to trailers. High rates of speed, in combination with varying aerodynamic forces, play a significant role in the control exercised over trailer towing combinations. Recommendations to define or alleviate some of the trailer towing combination safety problems are presented.

Search terms: Accident rates; South Carolina; Accident analysis; Accident statistics; Boat trailers; Travel trailers; Vehicle registration; Vehicle inspection; Accident causes; Accident types; Towing; Driver age; Driver sex; Campers (truck mounted); Day of week; Month; Injury severity; Accident factors; Light conditions; Weather; Traffic law violations; Failure caused accidents; Defective vehicles; High speed caused accidents; Vehicle weight limits; Recreational vehicles; Aerodynamics

HS-012 170 Fld. 1/5; 1/3; 5/17

1970 ANALYSIS OF MOTOR CARRIER ACCIDENTS INVOLVING VEHICLE DEFECTS OR MECHANICAL FAILURE

Bureau of Motor Carrier Safety, B32400

1972 20p

This report contains 5 tables of data compiled by type of defect from 54 passenger carrier accident reports. The accidents involving mechanical defects or failures resulted in 2 fatalities, 100 injuries, and \$159,371 property damage. Tables of data from 3,275 property carrier accident reports are also presented. The accidents involving mechanical defects or failures resulted in 48 fatalities, 862 injuries, and \$7,604,739 property damage. Faulty brake systems were by far the largest contributor to the mechanical defect accidents. Mechanical defects or failures of brake systems were involved in 54.3% of the passenger carrier accidents and 24.2% of the property carrier accidents. Six hundred and thirty-four accidents involved rollaway vehicles and 362 involved the transportation of mobile homes.

Search terms: Accident analysis; Motor carriers; Bus accidents; Truck accidents; Failure caused accidents; Fatalities; Injuries; Accident statistics; Damage costs; Vehicle fires; Brake failures; Bus defects; Truck defects; Mobile homes; Defective vehicles; Property damage accidents; Driverless vehicles

HS-012 187 Fld. 1/5; 4/7

SYMPOSIUM ON THE USE OF STATISTICAL METHODS IN THE ANALYSIS OF ROAD ACCI- DENTS, CROWTHORNE, ENGLAND, 14-16 APRIL 1969. PROCEEDINGS

Organisation for Economic Co-operation
and Devel. (France), O19200

1970 210p refs

Road research series.

Thirty-five reports dealing with regression methods, joint frequency analysis, probability models, multivariate analysis, international comparisons, data

1/5 Statistical data (Cont'd.)

HS-012 187 (Cont'd.)

gathering, classification, and statistical results are summarized. Applications cover the stages of accident description and classification, accident trend analysis, accident causation and prevention analysis, and empirical validation.

Search terms: Statistical analysis; Accident analysis; Regression analysis; Probability theory; Accident rates; Highway accident potential; Chi square test; Insurance claims; Insurance rates; Mathematical models; Multivariate analysis; Factor analysis; International factors; Rural highways; Rural intersections; Injury severity; Injury probability; Fatality rates; Accident survival time; Data acquisition; Accident types; Accident severity; Age factor in accidents; Accident causes; Accident prevention; Accident statistics; Accident records; Accident risk forecasting; Accident investigation; Driver characteristics; Vehicle mileage

AVAILABILITY:

O.E.C.D. Publications
2 Rue André-Pascal
Paris-16; France \$5.25

HS-012 193 Fld. 1/5; 5/3

CHARACTERISTICS OF MOTORCYCLE ACCIDENTS

Japanese Council of Traf. Science,
J02800

1971 50p

Results of a survey of motorcycle usage and accidents in Japan are presented. Statistics are given for motorcycle operator fatalities and injuries, operator characteristics, accident location and causes, and the use of roll bars and protective helmets.

Search terms: Motorcycle accidents; Motorcycle operator fatalities; Motorcycle operator injuries; Fatalities by age; Fatalities by sex; Accident causes; Accident location; Helmets; Roll bars; Japan; Motorcycle registration; Accident rates; Time of accidents; Motorcycle passengers; Motorcycle maintenance; Injury severity; Injuries by body area; Injury causes; Safety device effectiveness; Accidents by vehicle size; Accident statistics; Accident factors; Damage severity

2/0 HIGHWAY SAFETY

HS-810 245 Fld. 2/0

INTERNATIONAL ASPECTS OF ROAD SAFETY

by R. Brenner

National Hwy. Traf. Safety Administration, N19900

1972 17p

Presented at the Institute of Traffic Engineers meeting, San Gabriel, Calif., 18 Oct 1972.

The programs of NATO's Committee on the Challenges of Modern Society for promoting international cooperation in the study of environmental problems are outlined. The U.S. is responsible for coordinating the road safety efforts which are comprised of the following projects: alcohol and highway safety (Canada), vehicle inspection (Germany), identification and correction of accident prone locations (France), pedestrian safety (Belgium), emergency medical services (Italy), accident investigation (Netherlands), and experimental safety vehicles (U.S.) Each of the projects is briefly described.

Search terms: International factors; Environmental factors; Highway safety programs; Safety cars; Experimental vehicles; Accident investigation;

Emergency medical services; Alcohol breath tests; Vehicle inspection; Pedestrian safety; Accident location; Drinking drivers

AVAILABILITY: NHTSA

HS-810 246 Fld. 2/0

YOUTH AND HIGHWAY SAFETY: THE ANSWERS ARE BLOWIN' IN THE WIND

by C. H. Hartman

National Hwy. Traf. Safety Administration, N19900

1972 10p

Presented at Traffic Representatives of Arizona Governor's Youth Council Conference, Phoenix, 14 Nov 1972.

Young people are urged to become involved in highway safety action programs. Seat belt usage and alcohol countermeasures are areas in which involved youth could make significant contributions.

Search terms: Adolescents; Young adults; Drinking drivers; Seat belt usage; Highway safety programs; Community support; Alcohol usage deterrents; Problem drivers; Alcohol Safety Action Projects

AVAILABILITY: NHTSA

2/4 Design and Construction

HS-012 146 Fld. 2/4

VEHICLE IMPACT TESTS ON A CHRISTIANI AND NIELSEN BRIDGE RAPAPET

by V. J. Jchu; G. R. Taylor

Transport and Road Res. Lab. (England), T33900

1972 20p 3refs
Report no. TRRL-LR-482

Impact tests with a car and a passenger coach were carried out on a bridge parapet. The novel feature of the parapet is the design of the posts which pivot about their bases against the resistance of built-in hydraulic shock absorber units. The parapet is intended as an alternative to Group P1 vehicle parapets which are required to contain a car weighing 1.5 Mg, striking at 113 km/h and 20°. The test car weighed 1490 kg, and struck the parapet at 99 km/h and 19°. It was redirected in a curved path first away from and then back towards the parapet in the desired manner. The passenger coach weighed 5.4 Mg, and struck the parapet at 89 km/h and 19°. It was contained by the parapet and redirected at an angle of 9° without overturning, although it exhibited appreciable roll towards the parapet. In these tests the containment and redirection properties of the hydraulic parapet were satisfactory for the car and were better than those of current Group P1 parapets for the heavier vehicle.

Search terms: Guardrail impact tests; Bridge parapet design; Deceleration; Vehicle weight; Rebound; Vehicle kinematics; Hydraulic barriers; Buses; Automobiles; Impact attenuation; Photographs; Impact angle; Impact velocity; Guardrail design

HS-012 148 **Flid. 2/4**

VEHICLE IMPACT TESTS ON REINFORCED CONCRETE BRIDGE PARAPETS

by V. J. Jhu; I. B. Laker

Transport and Road Res. Lab.
(England), T33900

1972 34p 1ref
Report no. TRRL-LR-485

During impact tests a reinforced concrete parapet adequately withstood

impacts from a passenger coach weighing 5670 kg, striking at 80 km/h and 20°, and contained a vehicle weighing 1530 kg striking at 113 km/h and at 20°. The transverse deceleration of private cars was reduced from about 8 g, to 5 g, by using energy absorbing systems either in steel or plastics fitted to the traffic face of the parapet. Damage to the cars was reduced and they were steered back to the parapet after impact. The same energy absorbing systems had less effect on the impacts with coaches although the vehicles were noticeably less damaged. Both systems include a guardrail mounted with its center 0.61 m. above the roadway which can be continued beyond the parapet and mounted on knock-down posts to form the safety fence, thereby eliminating the familiar transition problem at the ends of the parapet.

Search terms: Bridge parapets; Guard-rail impact tests; Bridge parapet design; Concrete guardrails; Energy absorbing systems; Plastics; Steels; Deceleration; Damage severity; Rebound; Vehicle kinematics; Buses; Automobiles; Vehicle weight; Impact velocity; Impact angle

HS-012 150 **Flid. 2/4; 2/1**

VEHICLE IMPACT TESTS ON FRANGIBLE AND YIELDING POST DESIGNS OF BRIDGE PARAPETS

by V. J. Jhu

Transport and Road Res. Lab.
(England), T33900

1972 24p 2refs
Report no. TRRL-LR-495

Two designs of post and rail bridge parapets have been developed which provide more positive containment of vehicles and better vehicle response after impact than conventional parapets. In one design the posts fracture at their bases at a predetermined transverse load-

ing, thereby minimizing the rolling motion of a large vehicle towards the parapet. In the tests both a car striking at 116 km/h and 20° and a coach striking at 82 km/h and 20° exhibited the same steer back response towards the parapet after impact. Maximum wheel penetration of the coach was 0.79 m. In the second design the posts yield, bending at their bases under impact from a large vehicle, but are not damaged by car impacts. In the tests a coach striking at 86 km/h and 20° was redirected at 13° to the parapet with a maximum wheel penetration of 0.36 m. A car striking at 109 km/h and 20° was steered back to the parapet after impact.

Search terms: Bridge parapet design; Breakaway structures; Guardrail impact tests; Energy absorbing barriers; Rebound; Vehicle kinematics; Fracture mechanics; Barrier collision tests; Impact velocity; Impact angle; Deceleration; Damage severity

HS-012 160 **Flid. 2/4; 4/3**

COST-EFFECTIVENESS TECHNIQUE FOR ANALYSIS OF ALTERNATIVE INTERCHANGE DESIGN CONFIGURATIONS

by J. A. Wattleworth; J. W. Ingram

Published in *Highway Research Record*
n390 p27-35 (1972)

1972 2refs

Sponsored by Highway Research Board Committee on Geometric Design and Florida Dept. of Transportation.

Cost effectiveness methodology is presented in the framework of a case study of the interchange of Fla-436 and I-4 north of Orlando, Florida. The linear programming model of the interchange capacity and the cost-effectiveness analysis provide highway designers with a powerful tool to use in the selection of optimal interchange configurations and

in the determination of a phasing program of future improvements. The designer can quickly consider many configurations, and the linear programming model, in fact, helps him determine the next logical configuration when the configuration under analysis has inadequate capacity.

Search terms: Benefit cost analysis; Highway design; Interchanges; Florida; Traffic volume; Traffic capacity; Peak hour traffic; Highway costs; Highway improvements; Linear programming; Mathematical models

HS-012 162 Fld. 2/4; 4/7

HIGHWAY CURVE DESIGN FOR SAFE VEHICLE OPERATIONS

by J. C. Glennon; G. D. Weaver

Published in *Highway Research Record* n390 p15-26 (1972)

1972 5rfs

Sponsored by Highway Research Board Committee on Geometric Highway Design.

Current design practice for horizontal curves assumes that vehicles follow the path of the highway curve with geometric exactness. The adequacy of this assumption was examined by conducting photographic field studies of vehicle maneuvers on highway curves. Results indicate that most vehicle paths, regardless of speed, exceed the degree of highway curve at some point on the curve. For example, on a 3° highway curve, 10% of the vehicles can be expected to exceed 4.3°. A new design approach is proposed. This approach is dependent on selecting an appropriate vehicle path percentile relation, a reasonable safety margin to account for unexplained variables that may either raise the lateral friction demand or lower the

Search terms: Highway design; Road curves; Mathematical analysis; Displacement; Pavement skid resistance; Skid resistance tests; Cornering; Pavement friction; Slip; Pavement skidding characteristics; Speed patterns; Lateral force; Computerized simulation

2/7 Meteorological Conditions

HS-012 156 Fld. 2/7; 3/8; 2/4

AUTOMOTIVE NOISE: ENVIRONMENTAL IMPACT AND CONTROL

by B. A. Kugler; G. S. Anderson

Published in *Highway Research Record* n390 p45-55 (1972)

1972 7rfs

Sponsored by Highway Research Board Committee on Geometric Design.

The steady increase in ambient noise levels in cities and suburbs is quickly becoming an important factor in the pollution of the environment. Among all sources of urban noise, automotive noise is the most widespread and important factor contributing to this increase. This paper discusses the effects of noise on people, the characteristics of automotive noise, and a method available to highway designers and engineers by which the environmental impact of the proposed highway on the surrounding community can be predicted. The paper concludes with a discussion of noise control through highway design. A quantitative example of such a method is discussed.

Search terms: Highway environmental impact; Noise control; Vehicle noise; Traffic noise; Acoustic measurement; Noise tolerances; Highway planning;

HS-012 152 Fld. 2/9; 1/4

ADVISORY SPEED SIGNS FOR BENDS

by K. S. Rutley

Transport and Road Res. Lab. (England), T33900

1972 28p 9rfs
Report no. TRRL-LR-461

Panels showing advised maximum speeds for bends have been attached to bend warning signs on some 150 bends in East Sussex, Dorset, and Worcestershire. Observations of their effects on speeds and on accidents have been made over a period of two years since they were erected. Although there appeared to be a reduction in the number of accidents on bends in all three counties when compared with the numbers of all other accidents on A roads in the counties, the reduction was only statistically significant in Dorset. It is suggested that the greater effect in Dorset may be due to the high number of non-local drivers in the summer months. Average speeds of vehicles in the bends were affected by the signs when the signs showed a speed different from the mean speed of vehicles before the signs were erected. The mean speed moved toward the advice given by the sign.

Search terms: Speed signs; Speed limit effectiveness; Road curve signs; Sign location; Accident location; England; Injury statistics; Accident prevention; Speed patterns; Accident rates; Speed differential; Warning signs

HS-012 155 Fld. 2/9

SOME PRINCIPLES FOR COMMUNICATING WITH DRIVERS THROUGH THE USE OF VARIABLE-MESSAGE DISPLAYS

1972 12refs

Drivers generally will be responsive to changeable message signs when the message presented is accurate and timely. The messages should maintain continuity, relate to actual traffic conditions, and give advance notice in relation to the location of the condition. Some problems encountered involve visibility, confusion with commercial displays, and confusion between similar letters and numbers.

Search terms: Changeable message signs; Speed signs; Speed limit effectiveness; Traffic information signs; Sign location; Sign visibility; Sign legibility; Character recognition

HS-012 158 Fld. 2/9

DESIGN AND STRIPING FOR SAFE PASSING OPERATIONS (ABRIDGMENT)

by G. D. Weaver; J. C. Glennon

Published in *Highway Research Record*
n390 p36-9 (1972)

1972

Sponsored by Highway Research
Board Committee on Geometric High-
way Design.

The goals of this study were to examine passing behavior on rural 2-lane highways; to compare study parameters with the current passing sight distance design standards; and to develop, where appropriate, design and striping standards compatible with current operating conditions. Of primary concern were passing maneuvers on highways with operating speeds of 50 to 80 mph. The current standards for design and striping were critically evaluated with particular emphasis given to the inequities between

tensuses of the passing maneuvers observed in the field studies; a new concept was developed that integrates design and striping to accommodate the safety and operational aspects of the passing maneuver.

Search terms: Passing; Sight distances; Highway design speed; Rural highways; Passing zone markings; No passing zones; Driver reaction distance; Two lane roads; Design standards

HS-012 168 Fld. 2/9; 4/7

DEVELOPMENT OF VEHICLE- FOLLOWING BEHAVIOR FOR AUTOMATED VEHICLE SYS- TEMS

by K. C. Kapur

Published in *Vehicle System Dynamics*
v1 n1 p3-15 (May 1972)

1972 43refs

Automation of vehicular traffic in different forms has been considered by many people. It offers many advantages. Vehicular traffic dynamics for automated vehicle systems are developed here using calculus of variations and optimal control theory. Using such an optimization approach, the relationship of the traffic dynamics developed here and the traffic dynamics which have been used extensively before for non-automated systems is also shown. Such an approach considers multiple objective functions for the system.

Search terms: Automatic headway control; Car following; Headways; Mathematical analysis; Equations; Linear systems; Nonlinear systems; Automatic traffic control; Automatic highways

HS-012 182 Fld. 2/9

ANNUAL SPEED STUDY

Prepared in cooperation with the Fed-
eral Hwy. Administration.

A study was conducted to determine speed distribution and speed trends by vehicle type on the Arizona state highway system. The speed samples were obtained using a radar speed meter and an unmarked vehicle at 24 permanent stations throughout the state. All sample vehicles were recorded under conditions which, theoretically, would enable driver to choose a speed without influences of geometric design, signing, vehicular congestion, inclement weather, or unsafe conditions. The resultant data were utilized to produce the various graphs, tables, and speed distribution curves shown in this report. Comparison of the composite speed trends with those in the 1971 study indicates that operating speeds have remained in close conformance with the speed levels reached in 1971, with the exception of trucks on the secondary system, which exhibited a substantial increase of 6.2% over speeds recorded in 1971.

Search terms: Speed studies; Speed patterns; Day vs night speeds; Speeds limits; Secondary roads; Primary highways; Rural highways; Arizona; Speed differential; Trucks

HS-012 185 Fld. 2/9

PLANNING CRITERIA FOR BIKEWAYS

by V. R. Desimone

Automobile Club of Southern California,
A79400

1972 28p

Presented at the American Society of
Civil Engineers National Transporta-
tion Engineering Meeting, Milwaukee,
17-21 Jul 1972.

HS-012 185 (Cont'd.)

A transportation planning process is examined in order to determine the proper scale of development and investment in bicycle facilities. The type of bikeway facilities that can be provided in response to varying needs are the exclusive bikeway, the restricted bikeway, and the shared bikeway. The exclusive bikeway is a specific right-of-way for bicycles only. The restricted bikeway is a right-of-way for the preferential use of bicycles. The shared bikeway is a shared with other uses and is specified only by signs and markings. Warrants for the selection of bikeway types are discussed. Physical design criteria are reviewed and a summary of current practice in design of bicycle facilities is made. The cost of developing bikeway facilities is also reviewed and the issue of financing discussed.

Search terms: Bikeway planning; Bikeways; Lane usage; Trip purpose; Trip length; Travel time; Bicycle lanes; Lane width; Traffic volume; Highway design speed; Design standards; Financing

3/0 HUMAN FACTORS

3/1 Alcohol

HS-012 172 Fld. 3/1; 3/12

THE INFLUENCE OF ALCOHOL ON THE DETECTION OF LIGHT SIGNALS IN DIFFERENT PARTS OF THE VISUAL FIELD

by J. M. von Wright; V. Mikkonen

Published in *Scandinavian Journal of Psychology* v2 p167-75 (1970)

1970 8refs

Supported by the Finnish Foundation for Alcohol Studies.

A signal detection task lasting 40 minutes in parallel with a simple tracking task was performed by six subjects, 12 times each. They reported every other second whether or not a signal was given in any one of 10 widely spaced locations; 0.5 or 1.0 ml alcohol/kg body weight (or no alcohol) was given 25-35 minutes prior to the task. Hit rate (HR) covaried with tracking efficiency. Variation in signal probability had no effect. Alcohol had a strong and uniform effect on three experienced subjects, reducing HR for all signals and producing a funneling effect, but had little effect on the performance of three inexperienced subjects. Motivational variables which may account for the individual differences are discussed.

Search terms: Alcohol effect on vision; Driver performance; Visual perception; Vigilance tasks; Tracking; Driving task analysis; Visual fields; Visual degradation; Signal recognition; Variance analysis

HS-012 186 Fld. 3/1; 1/5

ROAD SAFETY ACT, 1967, U.K.

by J. D. J. Havard

British Medical Assoc., B25800

1968? 18p 14refs

Presented at Alcohol and Traffic Safety, Joint Conference of Committee on the Challenge of Modern Society Road Safety Project and the Organisation for Economic Co-operation and Development, Washington, D.C.

A summary of British alcohol laws from 1927 to 1967 is presented. Jury concepts of drunk and/or driving under the influence of alcohol are distinguished. Police powers of the act are explained. Fatality and injury statistics are given. After the passage of the Road Safety Act of 1967, the fatality rate dropped 15%.

Search terms: Road Safety Act of 1967 (Great Britain); Alcohol laws; Blood alcohol levels; Alcohol breath tests; Fatality rates; Injury rates; Pedestrian fatalities; Driver fatalities; Passenger fatalities; Great Britain; Drinking drivers; Driver intoxication; Accident rates; Accident statistics

3/2 Anthropomorphic Data

HS-012 184 Fld. 3/2; 2/9; 5/4

THE HUMAN FACTOR IN AUTOMOBILE ACCIDENTS

G. A. Peters

Published in *International Record of Medicine* v171 n9 p558-62 (Sep 1958)

1958 2refs

The necessity of human factors engineering in automobile design and the need for standardization in traffic control devices are briefly discussed. A government agency to sponsor and coordinate intensive research designed to provide more appropriate standards and recommendations pertaining to highway safety is proposed. A systems approach to the vehicle itself, the human operator, and the highway environment is needed.

Search terms: Human factors engineering; Accident factors; Driver vehicle road interfaces; Federal role; Automobile design; Traffic law uniformity; Systems analysis; Man machine systems; Traffic control device uniformity

3/4 Driver Behavior

HS-012 136 Fld. 3/4

FATIGUE IN SIMULATED CAR DRIVING

by E. I. Dureman; C. Boden

Published in *Ergonomics* v15 n3 p299-308 (May 1972)

Summaries in French and German.

The aim of this study was to assess the effects of four hours' continuous driving in a car simulator on performance, subjective fatigue, pulse rate, respiratory rate, skin resistance, and neck muscle tension, intra-subject correlations between the latter variables and performance over time; and to study these psychological and physiological measures when arousal was stimulated by the pairing of an electric shock with steering errors. The results showed that all subjects had a progressive performance decrement over time in parallel with increased feelings of fatigue. There was also a decrease in pulse and respiratory rates. Skin resistance showed continuous increment over time. Covariations over time between performance variables and physiological variables were rather high in most individuals. The expectation of an electric shock in connection with steering errors yielded higher subjective and autonomic arousal, slower performance decrement over time, and also lowered variability, both within and between subjects for all the variables recorded.

Search terms: Driver performance; Driver fatigue; Driver monitoring; Heart rate; Respiration; Driver errors; Steering; Driver reaction time; Regression analysis; Electric shock; Vigilance tests; Driving simulation

HS-012 179 Fld. 3/4; 5/14

ADOPTION OF INNOVATIONS IN ROAD SAFETY

by D. Sheppard

Published in *Occupational Psychology* v45 n2 p133-7 (1971)

1971 12refs

Research techniques are needed to evaluate the effectiveness of attempts to

get new road safety measures more widely adopted, whether the attempts are made through legislation or by propaganda. The desired end is a reduction in accidents, but even though accidents are unaffected, changes in behavior or in attitudes may be achieved. Evaluation of whole campaigns may be less useful than detailed study of individual approaches used within a campaign; such study may show what were the good or bad features of the means employed to persuade road users to behave differently and distinguish these from the difficulties inherent in getting the new idea across to the particular group in question. The attempt to encourage seat belt use is briefly discussed.

Search terms: Psychological factors; Seat belt usage; Motivation research; Driver attitudes; Safety program effectiveness; Safety campaigns; Driver behavior research; Safety propaganda; Innovation

HS-012 180 Fld. 3/4

YOUTHFUL DRIVERS AS A SPECIAL SAFETY PROBLEM

by L. G. Goldstein

Published in *Accident Analysis and Prevention* v4 n3 p153-89 (Sep 1972)

1972 100refs

Presented at the Symposium on the Young Driver, Reckless or Unprepared? Chapel Hill, N. C., 21 Oct 1971.

Drivers aged 15-24 comprised 21% of the 1970 driving population, but accounted for 34% of those involved in fatal accidents. Statistics are presented for such factors as driver sex, traffic violations and convictions, alcohol, drugs, motorcycle use, and personality. A diagnostic and remedial approach towards problem drivers is recommended.

Search terms: Adolescent drivers; Age factor in accidents; Young adult

drivers; Male drivers; Female drivers; Sex factor in accidents; Fatality rates; Convictions; Traffic law violations; Drinking drivers; Drug caused accidents; Motorcycle accidents; Driver characteristics; Accident types; Driver personality; Marital status; Driver education evaluation; Driving effect on scholarship; Problem drivers; Driver mileage; Driving conditions; Driver experience; Accident rates; Night driving; Correlation analysis

HS-012 195 Fld. 3/4

EMOTIONAL PROBLEMS IN DRIVING

by J. M. Dorsey

Published in *Journal of the Michigan State Medical Society* v56 p1147-58 (Sep 1957)

1957 refs

The relationship between emotional state and driving behavior is discussed. Drivers who easily lose their tempers are dangerous, as are drivers who fail to react to traffic conditions. Every driver needs to develop the principles of defensive driving.

Search terms: Emotions; Driver attitudes; Defensive driving; Driver behavior; Psychological factors

3/6 Driver Licensing

HS-012 181 Fld. 3/6; 3/1

NATIONAL CONFERENCE ON CURRENT PROBLEMS IN LICENSURE, WASHINGTON, D. C., NOVEMBER 9-10, 1971

American Medical Assoc., A34200; American Assoc. of Motor Vehicle Administrators, A25800

1972? 82p 16refs

3/6 Driver Licensing (Cont'd.)

HS-012 181 (Cont'd.)

Topics covered at the conference included cardiovascular disease, neurological conditions, emotional disorders, and visual problems as related to driver licensing, legal and enforcement aspects, health department role, administrative needs, and the role of alcohol.

Search terms: Driver licensing; Medical advisory boards; Driver physical fitness; Driver mental fitness; Driver physical examinations; Cardiovascular diseases; Medical factors; Neuro-circulatory disorders; Psychological factors; Vision disorders; Driver vision standards; High risk drivers; Problem drivers; Driver license laws; Legal factors; Traffic law enforcement; Driver intoxication; State motor vehicle departments; Driver license examiners; Drug effects; Alcohol laws; Driver license suspension; Driver license revocation; Alcohol Safety Action Projects; Emotions; Drinking drivers; Accident repeater drivers

HS-800 728 Fld. 3/6

TRAINING STATE AND LOCAL INSTRUCTORS IN THE USE OF NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION CURRICULUM PACKAGE: DRIVER LICENSE EXAMINER. FINAL REPORT

by V. E. Burgener

Technical Education Res. Centers, Inc.,
TOS800

1972 80p 17refs
Contract DOT-HS-100-1-142

A series of driver license examiner instructor training institutes was held to familiarize 75 key state instructors with the available materials and to improve their instructional skills. Each five-day institute was held in conjunction with a community college and offered college

level credit. Methodology for organizing and conducting the institutes, evaluation of effectiveness, subsequent technical instructor training service, and conclusions and recommendations are included.

Search terms: Driver license examiners; Instructor training; Curricula; Program evaluation

AVAILABILITY: NTIS

HS-810 247 Fld. 3/6; 3/4; 3/1

REMARKS AT THE SYMPOSIUM ON EFFECTIVE HIGHWAY SAFETY ADJUDICATION, DENVER, COLORADO, NOVEMBER 15, 1972

by C. H. Hartman

National Hwy. Traf. Safety Administration,
N19900

1972 12p

The drinking driver problem is discussed.

The NHTSA with the assistance of state and local officials is in the process of identifying and defining a program for driver control. Other problem areas are identified: violation of traffic laws is universal by the society as a whole; committing a violation does not seem to change a driver's belief that he is a good driver; the enforcement effort is generally low; most traffic penalties are light; the states have not enacted statewide traffic laws which can be duplicated by municipalities; many offenses do not result in physical apprehension; generally, the level of fine imposition is low; conviction reporting to the state licensing agencies is inadequate; when a driver's license is suspended, 56% of the drivers continue to drive.

Search terms: Traffic law enforcement; Problem drivers; Traffic law violations; Drinking drivers; Traffic

courts; Highway safety programs; Alcohol usage deterrents; Penalties; Driver prosecution; Driver identification

AVAILABILITY: NHTSA

3/9 Impaired Drivers

HS-012 171 Fld. 3/9; 3/10

TRANSPORTATION FOR THE HANDICAPPED, SELECTED REFERENCES

by L. E. Beaver, Comp.

Department of Transp., D17400

1969 33p 195refs
Report no. Bib-List-1

This bibliography covers material published between 1960-1969. The subject arrangement includes eight main categories: general, personal experiences, government activities, accessibility of travel facilities, air travel, automobiles, special equipment, and transportation and the blind.

Search terms: Bibliographies; Transportation of handicapped; Accessibility; Air transportation; Handicapped drivers; Deaf drivers; Automobile modification; Handicapped pedestrians; Handicapped passengers; Blindness; Self help devices; Human factors engineering; Prosthetic devices; Parking regulations; Disability evaluation

HS-012 190 Fld. 3/9; 1/5

PHYSICAL CONDITION REPORT OF COMMERCIAL DRIVERS INVOLVED IN ACCIDENTS FOR YEAR 1970

Bureau of Motor Carrier Safety, B32400

1971? 17p

Questionnaires were sent to all motor carriers who submitted accident reports

indicating that the drivers' condition may have been a causative factor in the accident. Conditions found in this study include: heart disease, drug usage, alcohol, dozing at the wheel, and black-outs. The total injuries, fatalities, and property damage resulting from the accidents involving abnormal physical conditions of drivers along with other related data are tabulated. Dozing at the wheel occurred with the greatest frequency. Of the 400 drivers, 303 (76%) fell asleep at the wheel resulting in a total of 10 fatalities, 139 injuries, and \$2,060,342 property damage.

Search terms: Driver physical fitness; Bla-kouts; Drinking drivers; Driver fatigue caused accidents; Driver intoxication; Drug caused accidents; Heart diseases; Sleep deprivation; Driver fatalities; Travel time; Truck driver performance; Truck accidents; Accident types; Property damage accidents; Driver age; Accident causes; Accident statistics

3/11 Pedestrians

HS-012 134 Fld. 3/11; 1/2

SOME FACTORS AFFECTING THE TRAUMA OF PEDESTRIANS INVOLVED IN ROAD ACCIDENTS

by R. R. Hall; A. J. Fisher

Published in *Medical Journal of Australia* v1 p313-7 (12 Feb 1972)

1972 8rcfs

Presented at the 43rd ANZAAS Congress, Brisbane, 1971.

Pedestrian accident data, recorded in New South Wales, have been analyzed for 1968. While pedestrians were involved in only 5.5% of all reported accidents, they contributed 13.5% of those injured and 24% of the fatalities. An analysis of some of the factors involved has shown that when a pedestrian is struck by a car, he or she will

receive on an average 20 injuries. These injuries will most likely be to the limbs, especially the legs, and to the head: in one out of 20 cases those injuries will prove fatal. It has also shown that the incidence of fatality rises sharply with pedestrians above the age of 50 years, and that the incidence of fatality appears to be related to general frontal styling of the vehicle, i.e., shape and height. Furthermore, the severity of trauma rises sharply above car speed of 20 mph.

Search terms: Pedestrian fatalities; Pedestrian injuries; Vehicle pedestrian collisions; New South Wales; Accident rates; Pedestrian age; Front structures; Vehicle design; Injuries by vehicle make; Impact velocity; Secondary collisions; Injury severity; Pedestrian vehicle interface; Injury causes

HS-012 153 Fld. 3/11

OPINIONS ON THE DESIGN AND MEASUREMENTS OF THE EFFECT OF A ROAD SAFETY LEAFLET

by M. H. Higgs

Transport and Road Res. Lab. (England), T33900

1972 20p 2rcfs
Report no. TRRL-LR-483

This experiment was carried out to measure the effect of a safety leaflet on the wearing of reflective and fluorescent clothing by children. Results showed that 91% of the children had been given a leaflet at school took the leaflet home and 88% of the parents interviewed had read all or some of it. This method of distribution is thus highly effective in getting information to parents. In the period immediately after distributing the leaflet the percentage of parents who had bought armbands or similar garments rose from 27% to 29% and within 3 months thereafter to 32%. There was an increase of 4% in the wearing of reflective and fluorescent garments by the children. Although

these increases are quite small, they should be viewed against the known difficulties in inducing such changes in behavior.

Search terms: Questionnaires; Reflective materials; Fluorescent materials; Child safety education; Pedestrian education; Protective clothing; Safety program effectiveness; Safety propaganda; Interviews

4/0 OTHER SAFETY-RELATED AREAS

4/2 Community Support

HS-012 194 Fld. 4/2

EVALUATING HIGHWAY SAFETY PROJECTS: A GUIDE FOR ADMINISTRATORS

by R. D. Lipps

Highway Users Federation for Safety and Mobility, H13400

1972 34p 29rcfs

Evaluation is a tool to help administrators determine project priorities, to devise and implement effective projects, and to justify appropriations. It provides information essential for prudent use of funds, manpower, facilities, and equipment. Other uses of evaluation techniques allow administrators to monitor the progress of continuing projects; to determine the degree to which projects meet objectives; to determine the effectiveness of safety efforts; and to provide facts necessary to obtain support for highway safety programs from the public, legislators, and people in the highway safety field.

Search terms: Highway safety programs; Program evaluation; Benefit cost analysis; Highway safety organization management; Safety program effectiveness

AVAILABILITY:

Corporate author \$1.00

HS-012 145 Fld. 4/7; 5/4

**EVALUATION TECHNIQUE—
TURBINE ENGINES AND
TRANSMISSIONS FOR OFF-
ROAD VEHICLES**

by B. B. Poore; G. Wright; B. E. Romig

Deere and Co., D07200

1972 7p 4refs
Report no. SAE-720759

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

A new power systems evaluation technique was developed to compare average fuel consumption and output power capability between different systems. Many combinations of engines, transmissions, and control systems could be represented by a modular general-purpose power train simulator. The torque and speed requirements of a vehicle were represented with a stochastic model. This technique was applied to the selection of a gas turbine transmission system for an off-road vehicle.

Search terms: Gas turbine engines; Transmissions; Off the road vehicles; Evaluation; Power output; Fuel consumption; Vehicle performance; Engine operating conditions; Torque; Computerized simulation; Engine speeds; Loads (forces); Simulators; Power trains

AVAILABILITY: SAE

HS-012 175 Fld. 4/7; 3/12

**A COMPUTER SIMULATION
MODEL OF DRIVER VISION
WHILE MERGING FROM A
FREEWAY ON-RAMP**

by K. C. Sinha; P. H. De Cabooter

1972 8refs

The vision simulation model was developed as a general model incorporating ramp and freeway geometry, driver physiological abilities, vehicular structure, and traffic data, including freeway lane traffic volume, freeway lane speed distribution, and ramp vehicle speeds. The proposed model is capable of processing both right- and left-hand merging situations. Although any type of ramp terminal could be included, only six geometric configurations were considered. The model was structured to examine the eye and head movements required of a driver attempting to merge into a freeway lane where traffic flow is dynamically simulated as a random process. An additional feature of the model is that the use of the exterior mirror can be investigated through a subroutine whenever it is determined that this mirror might act as an aid to the driver.

Search terms: Computerized simulation; Simulation models; Merging; Ramps; Eye movements; Head movement; Field of view; Freeway driving; Exterior rearview mirrors; Monte Carlo method; Driving task analysis; Flow charts; Speed patterns; Sight distances; Traffic characteristics; Highway characteristics; Visibility

5/0 VEHICLE SAFETY

5/1 Brake Systems

HS-012 177 Fld. 5/1; 5/20; 1/3

**FIELD TRIALS OF LOAD
SENSING VALVES FITTED TO
BRAKE SYSTEMS OF ARTICU-
LATED VEHICLES**

by H. A. Wilkins

Transport and Road Res. Lab.
(England), T33900

The valves were fitted to the rear tractor axle and modified the braking on that axle, more nearly balancing the braking distribution to the load distribution in both the laden and unladen vehicle conditions. The trials concerned over 250 vehicles fitted with valves, with a similar number without valves acting as controls. Two classes of vehicle were used: maximum capacity (30-32 ton gross vehicle weight) and medium capacity (22-24 ton gross vehicle weight). During a period of three years records of accidents involving all these vehicles were examined and those which occurred on public roads, totalling 757, were analyzed in detail. The evidence showed that load sensing valves reduced, but did not eliminate, jackknifing accidents for both sizes of vehicles but the overall accident results were disappointing. The trials emphasized the need for the vehicle braking parameters to be carefully chosen and for an in-service means of checking that the valves were still functioning as intended.

Search terms: Brake systems; Load modulation valves; Articulated vehicle performance; Jackknifing; Anti-jackknifing devices; Wheel locking; Axle load measurements; Accident factors; Vehicle weight; Field tests; Accident rates; Accident analysis; Tractor trailers; Vehicle size; Truck accidents; Rear axles; Axle brakes

5/4 Design

HS-012 133 Fld. 5/4

**THE EFFECTIVE FIT CONCEPT
AS USED IN ANSI B92.1-1970,
INVOLUTE SPLINES AND
INSPECTION (INCH AND
METRIC)**

by L. DeVos

Ford Motor Co., F18600

splines, as documented in the American National Standard B92.1-1970, is described. The Standard, in both the inch and metric version has a selection of tolerances, sizes, and pressure angles that provides the designer in any phase of industry a choice best suited to his needs and available manufacturing equipment. Examples in both English and metric units of measure are given.

Search terms: Splines; Standards; Engineering drawings

AVAILABILITY: SAE

HS-012 135 Fld. 5/4; 4/7

TORQUE SENSING VARIABLE SPEED V-BELT DRIVE

by L. R. Oliver; D. D. Henderson

Dayco Corp., D04100

1972 9p 4refs
Report no. SAE-720708

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

Equations have been derived for designing automatic tensioning variable speed V-belt drives. Such drives employ a screw principle to increase tension in the belt as loading of the drive increases. Adjustable tensioning makes it possible for variable speed drives to transmit significantly larger loads without overly penalizing belt life. This feature is possible because high tensions required by heavy loads are not retained during lighter loads experienced under normal operations. Drives have been designed by these equations and have been proven successful both in the field and laboratory. Experience in designing the

Search terms: Variable speed drives; Belt drive design; Torque; Cams; Coefficient of friction; Sheaves; Loads; Belts; Equations; Service life; Tension (mechanics)

AVAILABILITY: SAE

HS-012 144 Fld. 5/4

VERSATILITY IN COMPENSATED HYDRAULIC CIRCUITS

by L. Reimer

Cessna Corp., C35570

1972 7p
Report no. SAE-720778

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

A compensated hydraulic system is a system in which the pump automatically compensates or reacts, usually by a change in displacement, to some change in its operating condition or to some external signal. An almost endless variety of operating characteristics to provide many conveniences is possible. Pressure- and flow-compensated systems are familiar but still have new possibilities. In addition, torque compensation, speed compensation, and various hybrid systems are now feasible. The features of several existing and proposed systems are examined.

Search terms: Hydraulic equipment; Pumps; Hydraulic design factors; Pressure; Flow; Torque; Speed

AVAILABILITY: SAE

by S. G. Liddle; D. C. Sheridan; C. A. Arnann

General Motors Corp., G06600

1972 18p 25refs
Report no. SAE-720758

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

Concern over exhaust emissions has revived interest in the gas turbine as a powerplant for passenger cars, and concern over cost has stimulated interest in the single-shaft version of this engine. A novel transmission is needed to compensate for the inherently poor output characteristics of the single-shaft engine. The rated power and response time of the engine and the efficiency and power split of the transmission are shown to be the primary parameters influencing vehicle acceleration. Some factors affecting engine response time are reviewed. Transmission parameters are studied by considering standing-start accelerations of an automobile powered by a fixed-geometry single-shaft engine using versions of three of the many types of possible transmissions. For the combinations considered, the fixed-geometry single-shaft engine cannot easily provide vehicle performance matching that of the traditional two-shaft turbine engine, if both start with the compressor idling at half rated speed. Higher idle speed improves engine acceleration but increases idle fuel consumption. Any cost advantage realized through selection of a single-shaft engine must be balanced against the cost of the transmission chosen to accommodate engine output characteristics.

Search terms: Gas turbine engines; Acceleration; Transmissions; Turbine

5/4 Design (Cont'd.)

HS-012 147 (Cont'd.)

shafts; Engine performance; Power output; Performance characteristics; Mathematical models; Engine speeds; Hydraulic torque converters; Gear boxes; Economic factors; Automobile engines; Idling; Engine response time; Aerodynamic torque converters; fuel consumption

AVAILABILITY: SAE

HS-012 183 Fld. 5/4

TOWARDS MORE SAFETY ON HIGH VOLUME AUTOMOBILES—GOALS AND ACHIEVEMENTS

by C. S. Chapman; E. S. Kiefer

Opel (Adam) A.G. (West Germany); O14300 General Motors Corp., G06600

1972

Presented at Work and Res. Society for Traf. and Traf. Safety Meeting, Cologne Univ., West Germany, 5 Oct 1972.

The Opel Safety Vehicle program is directed toward the development of a 2000 lb. passenger car with an upper weight limit of 2200 lbs., based on high volume production technology and the utilization of conventional materials to achieve the highest level of safety performance within these parameters. The vehicle Opel is developing will serve as a tool for developing safety systems which can be introduced into actual production in the near future as well as establishing the potential crash levels that a 2000 lb. production-built passenger car can achieve, sold at a price which people can afford to pay. Product reliability, good controllability of cars, and crashworthiness are the three major objectives. Impact tests of present production cars are described, together with injury severity indexes.

Search terms: Crashworthiness; Safety cars; Occupant protection; Injury severity index; Experimental automobiles; Impact tests; Vehicle weight; Vehicle control

HS-012 192 Fld. 5/4; 1/2

NONOPERATING MOTOR VEHICLE SAFETY STUDY. SPECIAL STUDY

National Transp. Safety Board, N30000

1972 16p 10refs
Report no. NTSB-HSS-72-3

Accident or injury hazardous conditions of nonmoving vehicles include vehicle servicing and maintenance, accidental operation of controls by children, vehicle occupant and cargo accommodation, fire, and poisoning. The inadequacy of injury data is noted and possible data sources are reviewed. The statutory role of NHTSA in nonoperating safety efforts is examined, and the experimental safety vehicle program in relation to nonoperating safety features is discussed. Recommendations are made to provide consumer information on nonoperating hazards which could be eliminated or reduced, to identify the quantitative role of nonoperating hazards, and to encourage nonoperating safety features in experimental safety vehicles.

Search terms: Parked vehicles; Child injuries; Passenger compartments; Data acquisition; Safety design; Safety cars; Injury prevention; Consumer education; Experimental automobiles; Hazards; Automobile safety characteristics; Flow charts; Vehicle safety; Vehicle fires; Carbon monoxide poisoning; Accident risks; Injury risks

HS-800 684 Fld. 5/4; 3/2

BASIC RESEARCH IN CRASH-WORTHINESS 2—LOW SPEED IMPACT TESTS OF UNMODIFIED VEHICLES. INTERIM TECHNICAL REPORT

K. N. Naab

Cornell Aeronautical Lab., Inc. C67200

1972 102p 3refs
Contract FH-11-7622
Report no. CAL-YB-2987-V-1

Results of four tests of standard automobiles impacting flat concrete and pole barriers are presented. Two of the test vehicles were full size 1969 Ford sedans and two were 1971 Chevrolet Vega 2300 sedans. Impact velocities were approximately 8 mph. Three instrumented unrestrained anthropometric dummies were on-board each test vehicle, two in the front seats and one in the right rear position. Passenger compartment accelerations are presented along with accelerations recorded in the head, chest, and pelvic areas of the dummies. Occupant accelerations are compared briefly with human tolerance data and it is concluded that no severe injuries would have resulted in the four tests.

Search terms: Crashworthiness; Low speed impact tests; Pole impact tests; Head on impact tests; Barrier collision tests; Vega; Anthropometric dummies; Chest acceleration tolerances; Head acceleration tolerances; Pelvic acceleration tolerances; Seat occupation; Injury severity index; Impact velocity; Vehicle weight; Accelerometers; Fords; Damage; Acceleration

AVAILABILITY: NTIS

HS-800 686 Fld. 5/4; 4/7

BASIC RESEARCH IN CRASH-WORTHINESS 2—PRE-COLLAPSE DYNAMIC ANALYSIS OF PLANE, IDEAL ELASTO-PLASTIC FRAME STRUCTURES INCLUDING THE CASE OF COLLISION INTO A NARROW RIGID POLE OBSTACLE

Cornell Aeronautical Lab., Inc., C67200

1972 345p 24refs
Contract FH-11-7622
Report no. CAL-YB-2987-V-3

by use of the modal-vibration (normal mode) method. The interval halving method is used in finding the root time at which one of the following events occurs: initiation of a new plastic loading or unloading condition or initiation of a structure rebound or recontact (after rebound) condition. An algorithm associated with the numerical computation, together with the computer program is also developed. This algorithm, and thus the computer program, contains all elements required for the prediction of various phases of elastic-plastic loading and/or unloading of two-dimensional frame structures up to and including the formation of the collapse mechanism, of locations and sequence of formation of new plastic hinges or disappearance of existing plastic hinges.

Search terms: Crashworthiness; Pole impact tests; Deflection; Dynamic models; Rebound; Elasticity; Plasticity; Algorithms; Mathematical models; Computer programs; Structural deformation analysis; Frame tests; Collision models; Equations of motion; Computerized simulation; Collapse; Mathematical analysis; Loading (mechanical); Crash response forecasting

AVAILABILITY: NTIS

HS-800 698 Fld. 5/4; 4/7

CRASH: A COMPUTER SIMULATOR OF NON-LINEAR TRANSIENT RESPONSE OF STRUCTURES; BASIS FOR CAR CRASH SIMULATION. RESEARCH REPORT

by J. W. Young

Philco-Ford Corp., PI6200

1972 120p 27refs

Contract DOT-HS-091-1-125;
WDL-7101-C7

computer simulation of highway vehicle impact is developed. The assumptions, approximations, and formulae to represent the car primary structure as a frame subjected to time varying loads are presented. The solution process and error control methods to predict non-linear transient response of the frame are defined. Strain energy is evaluated by numerical integration over the volume of the structure. This integration includes representing non-linear material characteristics. External work is evaluated in terms of assumed displacements, external force, and inertial loads. Elements of the structure are permitted to undergo small deformations about a reference position defined by large rigid body motions. Minimizing the total potential produces the solution of the equations of motion of the system.

Search terms: Computerized simulation; Accident simulation; Collision models; Mathematical models; Crash response forecasting; Equations of motion; Strain (mechanics); Displacement; Elasticity; Structural deformation analysis; Stress (mechanics); Numerical analysis; Rigidity; Time factors; Stress strain characteristics; Strain rate; Frames; Nonlinear systems; Loads (forces); Impact forces; Deformation; Stress analysis

AVAILABILITY: NTIS

HS-820 217 Fld. 5/4

INTERNATIONAL TECHNICAL CONFERENCE ON EXPERIMENTAL SAFETY VEHICLES (3rd), WASHINGTON D.C., MAY 30-JUNE 2, 1972. REPORT

National Hwy. Traf. Safety Administration, NI9900

1972 398p refs

The proceedings include status reports by governmental representatives and

Britain, Italy, France, Sweden, and Belgium. A discussion on rulemaking and experimental vehicles is included.

Search terms: Safety cars; Experimental vehicles; Foreign vehicles; Impact tests; Restraint system tests; West Germany; Japan; Great Britain; Italy; France; Sweden; Belgium; Safety design; Injury research; Automobile interior design; Rule making; Passive restraint systems; Vehicle handling; Tire research; Antilocking devices; Suspension systems; Occupant protection; Accident types; Crashworthiness; Compact automobiles

AVAILABILITY: GPO \$3.00

5/6 Fuel Systems

HS-012 137 Fld. 5/6

BUICK'S 1972 EXHAUST GAS RECIRCULATION SYSTEM

by A. L. Thompson

General Motors Corp., G06600

1972 6p

Report no. SA-E-720519

Presented at National Automobile Engineering Meeting, Detroit, 22-26 May 1972.

In 1972 models for sale in California, Buick first employed programmed-metered exhaust gas dilution of the engine intake charge as the major means of reducing oxides of nitrogen (NO_x) emission levels. The major considerations in the decision to use this means of reducing NO_x emissions, the design details of the total system, and the field experience to date are discussed. The relatively simple metering system described may be adequate, for many engines and applications, to accomplish the major reduction in NO_x required of 1973 model light duty vehicles. Much

5/6 Fuel Systems (Cont'd.)

HS-012 137 (Cont'd.)

present data suggest that NOx emissions may be reduced by charge dilution to levels between one and two grams per mile in average. That limit, and to a greater degree the attendant operational compromises, will depend greatly on the degree to which recirculated gas can be metered precisely to the requirements.

Search terms: Buicks; Exhaust gas recirculation; Nitrogen oxides; Exhaust emission control devices; Exhaust emission standards; Charge dilution; Valve deposits; Intake manifolds; Exhaust emission tests; Valve timing

AVAILABILITY: SAE

HS-012 149 Fld. 5/6

DIESEL EMISSIONS AS PREDICTORS OF OBSERVED DIESEL ODOR

by H. E. Dietzmann; K. J. Springer; R. C. Stahman

Southwest Res. Inst., S31800; Environmental Protection Agency, E17350

1972 19p 18refs
Contract PH-22-68-23
Report no. SAE-720757

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

The use of diesel exhaust-emissions measurements to predict the observed odor from diesel engine exhaust has been studied, using a group of 31 trucks and buses powered by a variety of diesel engines. Regression analysis of gaseous emissions at a variety of conditions has resulted in equations for use in predicting odor. Acrolein, carbon dioxide, total hydrocarbons, selected light hydrocarbons, nitric oxide, carbon monoxide,

and aliphatic aldehydes have been related to perceived odor. Some of these exhaust products are odorous and some are nonodorous yet indicative of the completeness of combustion. The empirical method, however, is somewhat less reliable than the observed odor based on a trained panel rating supra-threshold levels in terms of the PHS Quality-Intensity Odor Rating kit. In general, the greater variety of measurements and the fewer type of engines will increase odor prediction accuracy.

Search terms: Diesel engine exhaust emissions; Exhaust odors; Exhaust emissions measurement; Linear regression analysis; Forecasting; Gas chromatography; Equations; Carbon dioxide; Hydrocarbons; Nitric oxide; Carbon monoxide; Acroleins; Aliphatic aldehydes; Test equipment

AVAILABILITY: SAE

HS-012 151 Fld. 5/6

COMBUSTION SYSTEM PARAMETERS AND THEIR EFFECT UPON DIESEL ENGINE EXHAUST EMISSIONS

by R. Pischinger; W. Cartellieri

Technische Hochschule in Wein (Austria), T08000; AVL (Austria), A85500

1972 14p 11refs
Report no. SAE-720756

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

Exhaust emission characteristics of a production automotive diesel engine were studied. The particular engine was chosen because it is being marketed with a prechamber as well as with a direct-injection combustion system and, in both configurations, either naturally aspirated or turbocharged. In addition, an aftercooler was fitted to the turbo-

charged direct-injection engine. Methods for reducing exhaust emissions are discussed. A brief survey is given of potential emission control by catalytic converter, exhaust recirculation, and LPG dual-fuel operation. Basic investigations, conducted on single-cylinder direct-injection engines are reported. It is concluded that direct injection is the most promising combustion system for low-emission commercial automotive diesel engines, particularly when turbocharged and after-cooled, and that this type of engine can satisfy the 1975 California standards.

Search terms: Exhaust emission control; Diesel engine exhaust emissions; Catalytic converters; Exhaust gas recirculation; Dual fuel vehicles; California; Exhaust emission standards; Exhaust emissions measurement; Pre-combustion chamber engines; Combustion chamber design; Nitrogen oxides; Hydrocarbons; Turbocharging; Aftercooler; Exhaust emission tests; Carbon monoxide; Injection timing; Engine tests; Smoke; Engine operating conditions; Engine speeds; Fuel injection; Liquefied petroleum gases

AVAILABILITY: SAE

HS-012 176 Fld. 5/6; 2/8

MOTOR VEHICLE VISIBLE EMISSIONS

by M. I. Weisburd

Pacific Environmental Services, Inc., P00200

Published in *Field Operations and Enforcement Manual for Air Pollution Control*, v2 p6.6.1-6.6.23

1972 5refs
Contract CPA-70-122
Report no. APTD-1101

Vehicular emissions are the largest part of total air pollution in some urban areas. Emission control systems for gasoline powered vehicles deal with

crankcase, exhaust, and fuel evaporative emissions. Nuisance and opacity types of visible emission violations are mentioned, and procedures for following and halting offending vehicles are detailed. Causes of offensive diesel emissions are noted, and reading and halting procedures set out. Emission control systems that may be checked by enforcement officers are diagrammed.

Search terms: Exhaust emission control devices; Crankcase ventilation systems; Air injection reactor systems; Diesel engine exhaust emissions; Air pollution control devices; Evaporative emission control; Air pollution law violations; Vehicle air pollution; Crankcase emission control; Engine operating conditions; Police law enforcement responsibilities; Smoke; Odors

/11 Maintenance and Repairs

HS-012 178 Fld. 5/11; 4/6

CRASH DAMAGE TO AUTOMOBILES. AN INSURANCE RESEARCH STUDY

Allstate Insurance Co., A22200; Kemper Insurance Companies, K03800; Liberty Mutual Insurance Co., L07200; State Farm Mutual Automobile Insurance Co., 39450

1972 52p 4refs

Prepared in cooperation with American Mutual Insurance Alliance.

This report is based on analysis of more than \$28 million in crash damage to 1969-72 model cars, on a country-wide basis. The average repair bill for all 9,060 damaged cars in the study was \$321. Repairs on the 1972 models cost an average of \$339, about 6% higher than repairs recorded for the 1971 models during the same time period (late 1971 and early 1972), and about 8% higher than repairs on the 1969 models. Cost increases for the 1972 cars were

spread about evenly over parts and labor costs. Collision claims, which come mostly from the striking vehicle and from single vehicle crashes, involve more front end than rear end damage. Property damage liability claims, which come mostly from the struck vehicle, involve more rear end than front end damage. Collision claims also produce higher average repair costs than property damage liability claims. Overall, damage to front ends is more frequent and more costly than damage to rear ends. The most frequently damaged components are those located at or near the four corners.

Search terms: Automobile repair costs; Parts costs; Accident costs; Insurance claims; Damage claims; Damage costs; Automobile repair after accident; Damage patterns; Automobile models; Compact automobiles; Station wagons; Impact angle; Accidents by vehicle age; Damage severity; Property damage accidents; Accidents by vehicle size; Vehicle size; Economic analysis

5/14 Occupant Protection

HS-012 166 Fld. 5/14; 5/4

END OF THE AIR BAG? VOLKSWAGEN'S ESV SHOWS NEW THINKING ON PASSENGER RESTRAINT

by S. Bladon

Published in *Autocar* v136 n3968 p48-50 (4 May 1972)

1972

Safety belts which move into position by engine manifold suction and are tensioned by gas cell action are described. Volkswagen's anti-lock braking system and experimental safety car are described.

Search terms: Automatic seat belts; Shoulder harnesses; Knee restraints; Safety cars; Volkswagens; Antiskid

brakes; Antilocking devices; Experimental automobiles

HS-012 167 Fld. 5/14; 1/5; 1/2

WASHINGTON STATE PATROL SEATBELT STUDY, 1971

Washington State Patrol, W04500

1972 8p

Cover title: *Seatbelt Study 1971: Buckle Up.*

Washington State's 1971 record for seat belt usage reflects little improvement over 1970. Only 30,427 vehicle occupants out of 132,666 involved in investigated traffic accidents in 1971 were wearing seat belts. They represented only 23.5% of all the vehicle occupants involved, which is the same percentage as in 1970. Seat belt users were only one-third as likely to be killed or disabled in traffic accidents as non-users, and they were only five-sixths as likely to receive any other type of injury. In addition, seat belt users had a 10% better chance of avoiding any injury altogether. Overall, men used their seat belts more frequently than women. Persons in the age group from 35 to 64 had the best seat belt record. Children and teenagers used seat belts least frequently. Drivers had a far better seat belt record than did their passengers.

Search terms: Washington (State); Seat belt statistics; Seat belt usage; Seat belt effectiveness; Age factors in accidents; Sex factors in accidents; Fatalities; Injury statistics; Accident statistics; Injuries by seat occupation; Fatalities by seat occupation; Seat belt usage by seat occupation; Injury severity; Accident investigation

HS-012 191 Fld. 5/14; 5/4; 4/7

THE MECHANICS OF AUTOMOBILE COLLISIONS. FINAL REPORT

Naval Res. Lab., N34200

The damage and injury from automobile accidents is treated as a mechanical problem in mitigating the shock from collisions. General principles of energy and momentum are described and applied to the collision problem. Present work in the field of automobile safety during collisions is surveyed and possible mechanisms for dealing with excess kinetic energy during a collision are reviewed. It is recommended that passenger compartments be strong and rigid, that passengers be strapped into their seats at all times, that front bumpers of automobiles be required to interface properly with fronts, sides, and backs of all other vehicles on the road, and that front bumpers be required to absorb energy on a graduated-damage system.

Search terms: Energy absorption; Dynamic loads; Kinetic energy; Impact forces; Passenger compartments; Energy absorbing systems; Bumper height; Restraint system effectiveness; Accident types; Stopping distance; Collisions; Vehicle mechanics; Mathematical analysis; Secondary collisions; Safety design; Crush distance; Accident statistics; Fatality causes; Human deceleration tolerances; Occupant protection; Impact protection; Crashworthy bodies; Automobile safety standards; Energy absorbing bumpers

AVAILABILITY: NTIS

HS-800 711 Fld. 5/14

IMPROVED AIR BAG RESTRAINTS FOR FRONT SEAT COMPACT CAR OCCUPANTS.

**VOL. 1. EXECUTIVE SUMMARY.
FINAL REPORT**

by D. Friedman; H. A. Wilcox; A. Jordan; N. DiNapoli

Minicars, Inc., M46400

1972 24p
Contract DOT-HS-113-1-163

For abstract and search terms see
HS-800 712.

AVAILABILITY: NTIS

HS-800 712 Fld. 5/14

IMPROVED AIR BAG RESTRAINTS FOR FRONT SEAT COMPACT CAR OCCUPANTS. VOL. 2. FINAL PROGRAM REPORT

by D. Friedman; H. A. Wilcox; A. Jordan; N. DiNapoli

Minicars, Inc., M46400

1972 183p 3refs
Contract DOT-HS-113-1-163

Report for 26 June 1971-31 July 1972.

This report summarizes the effort to develop an improved passive restraint. The objective was to apply maximum tolerable deceleration to the occupant so as to achieve the highest possible safe vehicle crash velocity for future crashworthiness-modified compact cars. The result of the work was the advanced development of a passive (non-air bag type) restraint such that at a complexity level equivalent to three seat buckles and belts, a door hinge and latching mechanisms, some foam and appropriate structural attachments, controlled deceleration of front seat occupants within acceptable injury criteria limits can be provided in 40 to 45 mph impacts, and with some increase in complexity level, the occupant can be similarly protected.

at any speed for which compartment intrusion can be reasonably controlled. Based on this effort, and results of 140 sled tests and two full-scale crash tests, it is concluded that passive restraints can be effective in meeting safety standard injury criteria at speeds to 40 mph.

Search terms: Air bag restraint systems; Restraint system design; Three point restraint systems; Shoulder harnesses; Accident risk forecasting; Front seat passengers; Compact automobiles; Impact sleds; Barrier collision tests; Benefit cost analysis; Anthropomorphic dummies; Knee restraints; Photographs; Drivers; Passive restraint systems; Restraint system tests; Air bag inflation time; Occupant kinematics; Test facilities; Angle impact tests; Equations of motion; Chest acceleration tolerances; Head acceleration tolerances; Pelvic acceleration tolerances; Head restraints

AVAILABILITY: NTIS

HS-800 740 Fld. 5/14; 5/2

SCHOOL BUS SEAT RESTRAINT AND SEAT ANCHORAGE SYS- TEMS. FINAL REPORT

by C. K. Wojcik, ed.; L. R. Sanders, ed.

California Univ. Inst. of Transp. and
Traf. Engineering, CI 7000

1972 208p 10refs
Contract FH-11-6971

Two full-scale collision experiments, head on and side impact tests, involving a school bus were conducted using research techniques and engineering methodology designed to provide realistic and objective findings relating to school bus passenger safety. The following categories relating to passenger injury causation were studied: location and type of impact; structural integrity of vehicles; vehicle size; seat design, location, and anchorage; type of restraint or force moderator; type of safety glass; passenger size; passenger kinematics and

interactions; forces sustained by passengers; and special emergency exit evaluations. On the basis of findings from the bus collision studies, the priority list for safety-related changes for school buses indicated by the results of a survey conducted before the crash tests was revised. However, the first six items on that list retained the same respective positions. These items are high-back safety seat, driver 20 G. safety seat, rear emergency exit, side emergency exit doors, elimination of interior protrusions, and standardization of bumper heights.

Search terms: School bus safety; School bus design; Vehicle vehicle impact tests; Side impact tests; Seat design; Restraint system design; Safety seats; Seat tests; Seat backs; Seat failures; Injury causes; Instrumented vehicles; Chest acceleration tolerances; Head acceleration tolerances; Escape from vehicle; Head on impact tests; Seat anchorages; Occupant kinematics; Injuries by seat occupation; Secondary collisions; Interior design; Exits; Bumper height; School bus bodies; Crashworthy bodies; Barrier collision tests

AVAILABILITY: NTIS

IS-810 248 Fld. 5/14; 3/1

BEYOND TOMORROW

by C. H. Hartman

National Hwy. Traf. Safety Administration, N19900

1972 22p

Presented at Governor's Council of Arizona Women for Hwy. Safety, 1st annual conference, Phoenix, 16 Nov 1972.

The three priority programs of NHTSA are alcohol countermeasures, crash survivability, and restraint systems. The capabilities and usage of seat belts are

discussed. Other advances in the field of occupant protection are mentioned. Educational campaigns underway to promote the use of seat belts and to discourage drinking and driving are outlined.

Search terms: Accident survivability; Safety education; Passive restraint systems; Alcohol Safety Action Projects; Highway safety programs; Federal state relationships; Alcohol usage deterrents; Seat belt usage; Restraint system effectiveness; Drinking drivers; Automobile safety characteristics; Crashworthiness; Occupant protection; Safety design

AVAILABILITY: NHTSA

5/18 Steering Control System

HS-012 157 Fld. 5/18; 4/7; 1/4

INSTABILITY ANALYSIS OF A VEHICLE NEGOTIATING A CURVE WITH DOWNGRADE SUPERELEVATION

by W. Zuk

Published in *Highway Research Record* n390 p40-4 (1972)

1972 3rcfs

Sponsored by Highway Research Board Committee on Highway Design and Committee on Surface Properties-Vehicle Interaction.

This study was initiated as a result of numerous skidding accidents occurring at locations where highway geometrics include a combination of downgrade, curve, and superelevation. Mathematical equations are developed for obtaining all the wheel forces (both normal and lateral) of a vehicle negotiating such a curve at the instant of incipient skidding for a variety of parameters. Factors that appear to be most important in regard to

critical skidding velocities are the lateral coefficient of friction between the tire and the road surface and driver maneuvering. Factors that appear to have little influence are superelevation (if relatively small), crosswind velocity, and type of vehicle (excluding tractor-trailers).

Search terms: Skidding accidents; Coefficient of friction; Mathematical analysis; Critical velocity; Road grades; Vehicle weight; Crosswind; Tire road contact forces; Vehicle stability; Road curves; Pavement skidding characteristics; Lateral force; Vehicle control; Tracking

5/19 Theft Protection

HS-012 173 Fld. 5/19; 4/8

TRANSPORTATION SECURITY: LITERATURE SURVEY. PRELIMINARY DRAFT

by Y. J. Hill, comp.

Department of Transp., D17400

1972 372p refs

Results of a literature search covering crime and transportation are presented as a preliminary bibliography. Modal aspects within transportation are accommodated by classifying data within the following sections: crime and security; transportation; air transport (freight); air piracy; motor transport; rail transport; urban transport; and water transport. The specially designed classification scheme permits intermodal approaches to specialized problems.

Search terms: Bibliographies; Hijacking; Theft prevention; Bus robbery; Freight transportation; Crime; Crime prevention; Air transportation; Marine transportation; Rail transportation; Theft; Urban transportation

012 154 Fld. 5/20

TECHNICAL ASPECTS OF 2-STROKE CYCLE SNOWMOBILE ENGINES

by T. Fujikawa

Kawasaki Heavy Industries Ltd. (Japan), K03400

1972 18p 2refs
Report no. SAE-720747

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

The design of a standard snowmobile engine is described. An ignition system for firing two plugs per cylinder was developed which prevents abnormal combustion and gave higher performance. For sports and racing engines it is necessary to improve power output, response, and acceleration.

Search terms: Two stroke cycle engines; Snowmobiles; Engine design; Engine performance; Engine mounts; Spark plugs; Combustion; Crankshafts; Intake systems; Exhaust systems; Cooling systems; Ignition systems; Fuel systems; Lubrication systems; Cylinders; Otto cycle engines; Engine operating conditions; Mathematical models; Radio interference

AVAILABILITY: SAE

HS-012 163 Fld. 5/20

SHEET MOLDING COMPOUND APPLICATIONS PROVEN ON SNOWMOBILES AND TRACTORS

by E. Ring; G. Kiefer

Goodyear Aerospace Corp., G24600

1972 5p 4refs
Report no. SAE-720744

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, 11-14 Sep 1972.

A relatively new technique for combining fiberglass reinforcements and polyester resins into reinforced plastic parts has given reinforced thermosets the capability of approximating metal finishes. This material is sheet molding compound, commonly called SMC. It has been used successfully in large quantities by automotive companies for the past four years. This paper covers the successful application of SMC from basic design to use in the field of some recreational and farm implement components. Several proven advantages for the use of fiberglass-reinforced plastic and SMC in particular are: design flexibility, dimensional stability, parts consolidation, high strength, light weight, low tooling cost, corrosion resistance, good machining operations, and repairability.

Search terms: Glass fiber reinforced plastics; Polyester; Thermosetting resins; Molding; Plastic sheeting; Physical properties; Snowmobile design; Farm tractor design

AVAILABILITY: SAE

HS-012 165 Fld. 5/20

ORRV: OFF ROAD RECREATION VEHICLES

Department of the Interior, D16200

1971 130p refs

The growth of recreational vehicle use is analyzed, including its social, environmental, and economic impacts. Federal and state legislation is summarized. Recommendations for uniform regulations and procedures for recreational vehicle use on public lands are presented.

Search terms: Snowmobiles; Motorcycles; Dune buggies; Four wheel drive

vehicles; Recreational boating; Campers (truck mounted); Mjimbikes; Environmental impact statements; Recreational vehicles; Recreational facilities; Driver characteristics; Land usage; Economic analysis; Sociological factors; Environmental factors; Vehicle noise; Vehicle laws; Federal laws; State laws; Off the road vehicles; Ecology; Public policy

AVAILABILITY: GPO

5/22 Wheel Systems

HS-012 161 Fld. 5/22; 5/20

OPTIMIZING TIRE AND MACHINE RELATIONSHIPS FOR MAXIMUM PERFORMANCE

by R. N. Klaas

Firestone Tire and Rubber Co., F12600

1972 7p
Report no. SAE-720742

Presented at National Combined Farm, Construction, and Industrial Machinery and Powerplant Meetings, Milwaukee, 11-14 Sep 1972.

This paper lays out some guidelines for selecting the proper tire for off-the-road vehicles and then maintaining those tires so the machine-tire relationship is optimized for maximum performance. Essentially, this involves selecting the proper size tire, choosing the best available tire design, construction, and compound compromise for specific job requirements, and finally following good maintenance practices on each unit.

Search terms: Off the road vehicles; Tire design; Tire performance; Tire sizes; Tire characteristics; Tire traction; Tire treads; Flotation tires; Tire maintenance; Tire load limits; Tire selection

AVAILABILITY: SAE

RESPONSE OF A ROLLING STRING-TYPE TIRE MODEL TO L A T E R A L W H E E L - P L A N E VIBRATIONS

by H. B. Pacejka

Published in *Vehicle System Dynamics*
v1 n1 p37-66 (May 1972)

1972 8refs

A theory has been developed for the analysis and prediction of the dynamic frequency response of lateral force and

moment. The new analysis: The theory establishes the force and moment response of a tire model which consists of a stretched circular string with mass, elastically supported to the wheel-center-plane. The analysis is confined to small deviations from rectilinear motion so that it is permissible to assume that sliding does not occur in the contact area. In this manner, the equations are kept linear. The theory which gives an exact analysis of the dynamic response of the model adopted shows satisfactory qualitative agreement with experiments. The change in the moment response due to tire inertia reduces the tendency to

over, changes in an unfavorable direction which, for castored wheels, may result in a decrease of the effective damping about the king-pin at higher speeds and frequencies.

Search terms: Pneumatic tires; Tire slip motion; Dynamic loads; Mathematical models; Wheel vibration; Tire moments; Tire side forces; Shimmy; Tire loads; Deformation; Caster; Equations of motion; Lateral force; Tire road contact forces; Vibration analysis; Tire vibration; Vibration response; Damping; Tire deflection

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